Sp. 5. Polynoë variegata, *Grube, Ann. Oersted.* 23.
Hab. Madeira, *Kröyer.*

Sp. 6. Polynoë nigrovittata, *Grube, l. c.* 24.
Hab. Rio Janeiro, *Kröyer.*

Sp. 7. Polynoë antarctica, *Kinberg, Bearbeitung der Würmer K. Svenska Fregatten Eugenies Resa* (fide *Carus*).
Hab. Straits of Magellan, *Kinberg.*

Sp. 8. Polynoë Aucklandica, *Schmarda, l. c.* 158.
Hab. Auckland, New Zealand, *Schmarda.*

Sp. 9. ? Polynoë longa.
Aphrodite longa, *Fabricius, Faun. Grœnland.* p. 313.
Hab. Coast of Greenland, *Fabricius.*
This species is said by Fabricius to possess 56 pairs (!) of elytra.

Sp. 10. ? Polynoë minuta.
Aphrodite minuta, *Fabricius, l. c.* 314.
Hab. Coast of Greenland ?, *Fabricius.*

[*To be continued.*]

On the Surface-fauna of mid-Ocean.

By Captain Samuel R. J. Owen, F.L.S.

[Read March 2, 1865.]

No. I.

Polycystina and allied Rhizopods.

Some years since, when surface-dredging for Pteropods, &c., in the Bay of Bengal and other parts, living Polycystina, together with a few species of Foraminifera, were frequently found attached to the nets. This induced me to systematically dredge the surface of mid-ocean for these Rhizopods on the first opportunity that afterwards presented itself. The regions chosen for these researches were the Indian and Atlantic Oceans, where there were few or no islands near, the washings from whose shores might interfere with the results.

The surface-dredgings were commenced near the Sandheads in the Bay of Bengal, and in a longitude of about 90° east, until we arrived at 10° south of the line, thence making nearly a direct course for the Cape Land, passing Madagascar at a distance of 250 miles. They were resumed in the South Atlantic Ocean, near the Cape of Good Hope, and continued in nearly a straight

course to latitude 33° north, and longitude 44° west, the equator being crossed in longitude 22° west. A register has been kept of the different species of animal life met with in each portion of these long tracts of ocean-surface, and rarely has the sea been found free from some species of Polycystina.

Many of these forms have been hitherto claimed by the geologist; but I have found them still enjoying life, according to their small powers, in this their true home, the siliceous shells filled with coloured sarcode, and sometimes this sarcode in a state of distention somewhat similar to that found projecting from the Foraminifera, but not in such slender threads.

I will now make a few observations on the appearance of these little gems of ocean. Having seen the Polycystina fresh from their native element in all their living splendour, I can assert that there are no objects in nature more brilliant in their colouring or more exquisitely delicate in their forms and structure. Unfortunately these tints can rarely be preserved. I have, however, coloured a few drawings to illustrate their appearance when fresh from the sea. Some are of but one colour—crimson, yellow, or blue; sometimes two of these colours will be found in the same individual, but always separate, and rarely if ever mixed to form green or purple. In a globular species, whose shell is made up of the most delicate fretwork, the brilliant colours of the contained blue and yellow sarcode shine through the little perforations very prettily. In two other specimens of the triangular and square forms, the respective tints of yellow and crimson are vivid and delicately shaded. In one the pink lines are concentric; while another is of a stellate form, the points and uncoloured parts being bright clear crystal, a beautiful crimson ring surrounding the centre portion.

I have dwelt upon the colours in order to give some idea of their natural appearance in the living state. The beautiful forms and delicately fine structure could be nearly as well seen in the fossil specimens.

The Polycystina appear to avoid the light, as they are rarely to be found on the surface of the sea in the daytime; it is after sunset, and during the first part of the night especially, that they make their appearance. I cannot say whether they make the bottom of the ocean their home during the day. The weight of their siliceous coverings would no doubt allow them to sink rapidly; and if they do so but to the distance of a few fathoms, it proves that they must have some means of extracting air from the

water, to enable them to rise again to the surface. Whether the living Polycystina are to be found at the bottom of the ocean can only be determined by deep-sea dredgings.

It will naturally be asked if I can throw any light on the propagation of the race. It is a subject I touch upon with some diffidence; but I must not pass by this very interesting topic without giving what little information I have been able to gather by a long and diligent search. Rare have been my opportunities of witnessing anything that seemed to elucidate this matter; but still sufficient has presented itself to enable me to offer or rather perhaps to hazard an opinion; but my facts and specimens may, at all events, be of some value.

I would refer to the mode in which two Diatoms or two Desmidiaceæ will unite, and how the contents of one will pass into the cell of the other. With Diatoms, &c., this process has been easily watched; with the rarer Polycystina such opportunities have been more difficult to obtain. I have seen the conjunction of two individuals, the yellow sarcode appearing as two separate yelks, one in each shell. One of my specimens shows the line of junction very distinctly, and, I think, proves that such specimens must not be taken as single individuals of another species. Another represents a similar case, in which only one shell is filled with the sarcode, the other being quite empty. A drawing was taken by me while at sea from a specimen in the live-box: this proved to me that the sarcode had not contracted in drying and thus filled only a portion of its original space. In a dead and dried specimen this might have been contended for. As I have said before, the thing is rare to witness; and it will require the evidence of other careful observers to clear up this point entirely to our satisfaction, for I hold it to be a matter of great interest.

In the cases I have observed, the siliceous shells appear to closely unite; they might be easily mistaken for one individual, if seen only in the fossil state, or after having been subjected to the action of nitric acid. It was the fact of the sarcode being found in only one portion that first gave me a clue to its real nature. I say *real*, provided always I am right in my conjecture.

The shells of some of the globular forms of the Polycystina, whose conjugation I believe that I have witnessed, are composed of a fine fretwork with one or more larger circular holes; and I suspect the junction to take place by the union of two such apertures. That the figures of these shells become somewhat distorted or elongated, and the passage of communication en-

larged, I do not take to be a difficulty; for I believe that, while living, some of the forms are to a certain extent elastic. Some species lose their globular form after death, and present a distorted surface. When the aperture is enlarged, it is easy to conceive that the elastic shelly portion is both distended and absorbed.

Although I have searched most diligently for the young of the Polycystina, I have been unable to find even comparatively small specimens of each species. I have therefore been led to doubt their growth in their present form. May not the Polycystina be the more perfect condition of some other creatures that attain their full size, and at the point of change or chrysalis-state are resolved into sarcode, upon which the siliceous shell is afterwards formed? (some minute marine Entozoa for instance?) or may not their first form of life be simple sarcode, or an *Amœba*? Some of the extremely thin shells still elastic seem to favour this supposition. If periodically, on increasing in size, they change their shells like the Crustaceans, where are we to look for the very small ones?

One globular species appears like a specimen of the Chinese ball-cutting—one sphere within another; but it is a marked and distinct kind.

I have not been able to meet with any cases of multiplication by division, unless the few specimens of conjugation which I have before noticed should hereafter prove to be of this nature: in most of the forms anything of this kind would be at once detected. There is one that at first sight seems to favour this notion; but as it has likewise an internal shelly portion, I do not think it can be looked upon in this light.

A case of the breaking-up of the contained sarcode into granules, as in the diatoms, was observed, and a drawing taken from the living specimen in the live-box. I would call attention to two kinds of egg-like forms—some yellow, others of a bright deep blue. The colour of this species generally is uniform—either all blue, red, or yellow—but not granular. It is but little I can say on this most important point; but I hope what I have witnessed, and here brought to notice, though but a few steps in advance, will show the road to be taken for further investigation.